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Variability in the Quality of Untreated High Moisture Silages as Related to the Apparent Success of Preservatives 1/

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The advent of ensiling as a popular method of hay crop preservation has been accompanied by a search for economically suitable methods for improving silage quality. This search has been directed, to a large extent, toward improvement of high moisture silage since most of the unsatisfactory silages fall into this classification. Under most circumstances the degree of success attributed to a method has been based on the differential in quality (known or estimated) between the treated silage and a corresponding untreated silage made from the same crop. Since the degree of success of the treatment is in effect directly related to the quality of the untreated silage, the authors have undertaken to study the variability in quality of untreated silages made from two similar forages in two different years and the effect of these differences on the apparent success of adding a preservative.

Experimental Procedure

Two concrete stave silos (10' x 25') were filled simultaneously in 1953 with a first cutting of Orchard Grass-Ladino Clover mixture harvested without wilting. The forage in the No. 1 silo was stored without treatment while that in the No. 2 silo was treated with 5.1 lbs. of Kylage per ton.

The forage was weighed, sampled and analyzed previous to storage and as it was removed for feeding. An attempt at seepage collection was unsuccessful. The silos were opened following a 198-day storage period and the silage fed to milking cows in a feeding trial. Silage was fed to the limits of appetite as the only roughage. A simple grain supplement was fed according to production.

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Two more lots of silage were made from the same fields in 1954. The experimental procedure, with a few exceptions, and the silage treatments were the same as in 1953. The rate of Kylage application was 4.3 lbs. per ton and the apparatus for seepage collection was improved so as to get a more complete measurement.

Results

The chemical composition of the stored forages and the corresponding silages is presented in Table 1. It may be noted that the two forages stored in the same year were of quite similar composition. Differences in forage composition between years did occur particularly with respect to the content of crude fiber, sugar and carotene. However, these were differences not apparent from a general crop description of species, cutting, and dry matter content.

Differences in percentage of crude constituents of the two check silages (1953 and 54) were present although not particularly striking. However, differences in pH, ammoniacal nitrogen and the organic acids of these two check silages were marked. From the standpoint of these latter analyses the 1953 untreated silage was of poor quality but the 1954 untreated silage was of excellent quality.

The addition of Kylage to the 1953 silage resulted in improved chemical quality. This treatment, however, when applied to the 1954 crop resulted in no significant improvement of an already excellent silage.

Rather low efficiencies of nutrient preservation characterized all of these silages. High seepage losses were to a large extent responsible. Although seepage from the 1953 crop was not measured successfully, it was well established that the dry matter losses through seepage in the 1954 crop were a minimum of 11.0% of the dry matter stored.

Results of the feeding trial are presented in Table 2. These data show the 1954 untreated silage to have a considerably greater feeding value than the 1953 untreated silage, with respect to maintenance of liveweight and production level, palatability and dry matter digestibility. It is also shown that treatment of the 1953 crop with Kylage resulted in a silage of greater palatability which was reflected in lower liveweight losses. On the other hand, Kylage treatment of the 1954 crop (one making excellent untreated silage) resulted in no significant improvement of feeding quality as measured by these criteria.

Discussion

The data from the two experiments herein reported indicate that the final quality of an untreated silage is to a large extent unpredictable, particularly when only a general description of the forage crop is

obtainable. Therefore, the quality improvement resulting from the use of a silage preservative is to the same extent unpredictable.

It appears from these facts that the practice of making direct comparisons of a treated silage with a hypothetical or "average" untreated silage may often be misleading and result in differing appraisals of silage preservatives at different experiment stations. These data indicate the need for a more thorough understanding of the requirements for high quality untreated silage. These data also show the need for further research inquiring into the fundamentals of silage making in order that present trial and error procedures may be improved.

Table 1 - Average Composition of Silages and Percentages of Stored Nutrients Preserved for Feeding

	Composition As Stored[1]				Composition As Removed[1]				% of Stored Nutrients Preserved for Feeding			
	1953		1954		1953		1954		1953		1954	
	Untreated	Kylage	Untreated	Kylage	Untreated	Kylage	Untreated	Kylage	Untreated	Kylage	Untreated	Kylage
Dry Matter	19.4	20.6	18.4	18.3	22.9	23.9	23.9	24.6	74.4	77.0	76.4	76.8
Crude Protein	18.0	17.2	16.7	16.8	19.2	19.1	16.0	16.0	79.5	85.7	73.2	73.3
Ether Extract	2.6	2.7	2.7	2.7	3.0	4.1	4.6	4.3	85.2	117.4	130.4	122.6
Crude Fiber	26.0	25.5	22.8	23.4	30.7	29.9	28.4	27.9	87.7	90.3	95.1	91.5
N.F.E.	44.5	44.5	48.0	46.2	37.4	37.7	43.2	43.4	62.5	65.2	68.8	72.1
Ash	8.9	10.1	9.8	10.9	9.7	9.3	7.8	8.4	81.5	70.4	60.6	58.6
Sugar	5.4	5.6	8.8	9.1	0.2	0.3	0.5	0.8	2.8	3.4	4.6	6.5
Carotene	171.0	154.0	244.0	234.0	145.0	134.0	281.0	265.0	63.2	67.0	87.9	87.0
pH	6.12	6.12	5.55	5.52	4.98	4.52	3.76	3.67				
Ammon. Nitrogen	3.9	3.5	1.8	1.8	24.5	14.1	7.5	6.3	481.7	318.9	357.3	293.2
Acetic Acid					3.25	3.05	1.98	1.51				
Propionic Acid					0.72	0.31	.10	.06				
Butyric Acid					3.05	1.05	.03	.03				
Lactic Acid					1.80	4.90	7.78	8.00				

[1] Carotene as ug/gram of dry matter, ammoniacal nitrogen expressed as percent of total nitrogen, all other constituents except pH expressed as percentage of total dry matter.

Table 2 - Results of Feeding Trials

		1953 Crop		1954 Crop	
		Untreated	Kylage	Untreated	Kylage
Liveweight per cow:					
Initial	pounds	1,050.1	996.2	1,074	1,076
Average	pounds	1,035.8	987.4	1,095	1,094
Average gain per day	pounds	-.690	-.380	.740	.977
Milk Production[1]:					
Initial per cow per day	pounds	34.96	35.61	33.67	34.35
Average per cow per day	pounds	31.80	32.88	32.83	33.56
30-day decline	pounds	4.51	4.19	.88	.71
	percent	12.9	11.8	2.61	2.07
Feed dry matter consumed per cow per day:					
Silage	pounds	15.22	17.75	21.97	21.49
Concentrates	pounds	8.48	8.25	7.41	7.49
Total	pounds	23.70	26.00	29.38	28.98
Feed dry matter consumed per 100 pounds of liveweight per day:					
Silage	pounds	1.469	1.798	2.006	1.964
Concentrates	pounds	.819	.836	.677	.685
Total	pounds	2.288	2.634	2.683	2.649
Ratio - grain to milk		1:3.8	1:4.0	1:4.4	1:4.5
Digestibility of dry matter	percent	52.1	52.1	66.2	66.5

[1] Four percent fat-corrected milk.